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MULTIFUNCTIONAL ENHANCED FEED DATABASE AND VALUE MODELING

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Final Report

Multifunctional Enhanced Database And Value Modelling

Project # 20030436

Submitted by

V.J. Racz, D.A. Christensen, M. Drew, J.J. McKinnon, and M. Feist

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Summary:

The project objectives were: to provide a data management and interpretation initiative to meet the needs of feed researchers, individuals in the feed production industry and those in feed technology transfer activities. The development of the database has continued from the fall of 2004 and into 2006 building the framework to meet these objectives. To date the database has over 700 pea samples, >250 barley grain samples, >80 oat samples, >120 wheat samples, >500 forage samples of various types and more than 100 unusual feedstuffs such as lentil chaff. In 2006, some additional 500 warm season grasses analyzed under the forage ADF project has been added. The data and search parameters includes variety, location grown, others such as type and proximate nutrient analysis including carbohydrate fractions such as starch.

The project has built the necessary physical attributes and is now in the position of supporting proactive studies as it applies to specific applications within the crops livestock interface. Specifically these initiatives are: pea selection for fractionation, barley selection and type to meet feed needs as well as malting and wheat strategic development for feed and ethanol. Support has been given in providing access to information to various groups nationally and internationally as well as access to some 22 researchers and Saskatchewan Agriculture personnel on a direct basis. While the database at present is limited in scope by sample numbers, the potential use and direction for research and development activities is immense. It should allow planning and what's more provide for innovation on a broad scale beyond a limited group.

Multifunctional enhanced feed database and value modeling

Objectives: To develop an enhanced feed database and value modeling systems to

1. *provide* the basis for direction, prioritization, and coordination of feed research and development activities within the crops-livestock interface.
2. *assemble* and accumulate data from feed R & D activities, enabling the documentation of progress and coordination of results for utilization in commercial activities and by the crop and livestock industries.
3. *provide* enhanced feed database and feed evaluation technology to support feed research activities.
4. *provide* an enhanced feed database to support commercialization activities and feed utilization by the crops and livestock industry domestically and internationally.

The acquisition of funding for the database has allowed the start and development of a feed database management program. The project had arose from the crops livestock interface program and the need to provide a data management initiative to meet the needs of feed researchers, individuals in industry and technology transfer activities. While much of the data generated by researchers from laboratory analysis is present in an excel format and is convenient for specific data comparisons on a single spreadsheet, it is unmanageable for the 40 or 50 spreadsheets and more of data now coming available. This situation in feed resource planning, where past data cannot be easily accessed leads to errors and omissions and research based,on a less than ideal basis.

Method:

The project group D.A. Christensen, M. Drew, J.J. McKinnon, M. Feist, B. Rossnagel and V. Racz chose a proposal from the ITS group at the University of Saskatchewan to develop the database. This was started in February 2004 with a copy of their proposal included in a previous progress report. The proposal lists the methodology, type and function of the database and

deliverables. The SQL database chosen allows much flexibility and a large capability to handle data.

The database is made to accept data generated by laboratories in an excel format. This allows local data as well as outside data to be formatted and uploaded into the database. A screening process on data for inclusion is done and loaded on an individual basis, limiting uploading to a select group.

Security and access to change or adding of data to the database is limited and can only be done by a select group. The SQL database however can be accessed for use by others such as SAF staff doing research or Agriculture Canada through the use of a login procedure with controlled ports to the data. Login passwords are assigned on request. The SQL database being a research tool will be backed up nightly on a routine maintenance schedule as part of the U of S system. Documentation for users and manuals are being prepared as part of the package.

Once logged in, the user follows screens to do a search of the database. The user can search on a broad basis and narrow the search to specific characteristics as desired. (printed documentation and search parameters enclosed) The output can be on the screen or in Excel format to be uploaded to statistical programs.

Results:

The past reporting periods saw the physical development of the feed database by the ITS group at the University of Saskatchewan. Further in the last report documentation on using the database was provided. The database was available for testing and use on a trial basis. During the last reporting period the database has registered and allocated passwords to some 22 researchers and development specialists. Response to database searches have been good with little requests for changes to database procedures. The search fields and descriptions of feedstuffs are attached and shows the range of parameters searches can be done on. A search that has been done on wheat carbohydrate fractions is attached. To date the database has over 700 pea samples, >250 barley grain samples, >80 oat samples, >120 wheat samples, >500 forage samples of various types and more than a 100 unusual feedstuffs such as lentil chaff. In 2006, some additional 500 warm season grasses analyzed under the forage ADF project has been

added. Others that are being added on a consistent basis are those arising from projects that the P.F.R.C. is involved with.

There are other analysis of feedstuffs that occur and because of laboratory structure knowledge of and access to these results can be difficult. Conversely others in the system such as Agriculture Canada groups readily offer their analysis data. We would request that ADF as contracts are made for various projects that generate feed nutrient analysis be encouraged to share results on data so they may be entered in the database. The database has been designed to maintain confidentiality and restricted access. The database already does contain the oat samples for the low lignin high oil oat project. This has been used to guide the breeding program and resides separately in restricted access within the database.

The database has been particularly useful in both barley and feed wheat breeding programs. With the barley program and combining it with procedures for production economic evaluation, (previously developed under the CLI project) avenues for barley improvement were developed. The development of low hull content varieties and low degradation rate barley's were identified from these analysis. Because of ADF variability in varieties it was hypothesized that low hull selection would be possible. Economic analysis of production costs show a strong focus to combine malting varieties with feed characteristics.

Currently with Pierre Hucl of the CDC there is an effort being made to gather data on as many wheat samples as possible. This is an effort to identify higher starch varieties for ethanol production. Yield of energy, per acre as predicted from analysis and yield data is being used to identify superior wheat. There is a very strong positive correlation between feed wheat for swine and poultry and those also most suited for ethanol production. While it can be argued that technology in enzyme use makes a variety of wheat okay for ethanol production, the fact remains that the wheat with highest digestible energy is also the most efficient ethanol producer.

The database has been also used to identify processing opportunities on selected varieties of peas and other feed ingredients. The projects attention has now focused on data entry and providing analysis to identify directions for crop improvement. The priority item currently is the

development of wheat for ethanol and feed. This initiative is being developed through the Saskatchewan Ethanol Development Council and researchers as a cooperative effort. The clients in this process is the one existing ethanol plant plus the two being constructed. It is strongly suggested that ethanol wheat and feed wheat production are symbiotic. Also previously it has been shown that feed wheat and CPS wheat currently produce more digestible energy for swine per acre than barley. Wheat production is in short more efficient for non ruminants. The problem with ruminants is that of energy capture when feeding wheat. The database as a supportive tool is a key part of this initiative in allowing data analysis .

Another related activity has been the development of pea fractionating facilities. A new plant is being initiated for pea fractionating that bases it's business plan on compositional analysis of peas. Another company Codrico located in the Netherlands has on the basis of analysis data is looking to Canada for it's pea procurement for fractionation.(copy attached) The main product of processing is pea protein concentrate for the aquaculture industry leaving the starch as a byproduct. Higher protein peas are an obvious requirement for greater plant efficiency, but also are starch characteristics that give value to the byproduct. Glues, noodles, feed and ethanol are proposed uses for the starch being contemplated. The economic impact of this one plant can be 35 million dollars yearly and double that if the second plant is realized. This is only one example of the impact of support from crops livestock interface activities and modeling through a competent database.

Conclusions:

While the database is increasing in size, even now the potential use and direction for research and development activities is large. It should allow planning and what's more provide for innovation on a broad scale beyond a limited group. We would request that ADF as contracts are made for various projects that generate feed nutrient analysis be encouraged to share results on data so they may be entered in the database. The database has been designed to maintain confidentiality and restricted access and will satisfy most situations.

Technology transfer:

Numerous presentations using data from the database have been made and given credit to the database. Specifically there have been presentations and demonstrations of the database made to an update session of Sask. Agriculture and Food in March/05. The database has been demonstrated to Agriculture Canada officials, and others in the University.

A seminar and workshop was presented in February/06 to researchers and feed developers.

Individuals involved in the project were:

Ms. Kathe Harder (being replaced by Brenda Wright)

Ms. Pam Kish (continues as the main database administrator)

D. A. Christensen

J. J. McKinnon

M. Drew

M. Feist

B. Rossnagel

T. Warkentin

P. Yu

Vern Racz

ITS group U of S